

What is Claimed is:

1. A partial reinforcing method of a metal material for reinforcing a part of the metal material, comprised of:

a first press step for generating a plastic strain by a plastic flow of metal material on a front surface and a rear surface of the part to be reinforced, to form a front convex-concave surface and a rear convex-concave surface; and

a second press step for further generating the plastic strain by the plastic flow on the front convex-concave surface and the rear convex-concave surface, to form a front plane surface and a rear plane surface.

2. A partially reinforcing method according to claim 1, wherein the second press step simultaneously gives the metal material a static hydraulic pressure in the press direction and a shear force in the plane direction, upon forming of the front plane surface and the rear plane surface.

3. A partially reinforcing method according to claim 1 or 2, wherein the metal material is an aluminum alloy.

4. A partially reinforcing method according to one of claims 1 to 3, wherein the metal material has thickness of 2 to 10 mm.

5. A partially reinforcing method according to one of claims 1 to 4, wherein each of a front punch and rear punch used in the first press step has a press surface on which plural annular convex-concave portions are formed about an axis thereof coaxially.

6. A partially reinforcing method according to claim 5, wherein a pitch of the adjacent annular concave or concave portions is 1 to 6 times of thickness of metal material.

7. A partially reinforcing method according to claim 5 or 6, wherein the cross section of annular convex portion and annular concave portion is comprised of an arch of which radius is 1 to 6 times of the thickness of metal material.

8. A partially reinforcing method according to claim one of 1 to 4, wherein each of a front punch and a rear punch used in the first step has press surface on which plural diverge convex-concave portions diverging from an axis thereof are formed.

9. A partially reinforcing method according to claim 8, wherein the angle defined by the adjacent convex portions is 10 to 30 degrees.

10. A partially reinforcing method according to claim 8 or 9, wherein the angle defined by the convex portion on the front surface and the convex portion on the rear surface is smaller than 30 degrees.

11. A partial reinforcing method of a metal material for reinforcing a part of the metal material, comprised of:

a first press step for generating a plastic strain by a plastic flow of metal material on a front surface or a rear surface of the part to be reinforced, to form a front convex-concave surface or a rear convex-concave surface; and

a second press step for further generating the plastic strain

by the plastic flow on the front convex-concave surface or the rear convex-concave surface, to form a front plane surface or a rear plane surface.

12. A partially reinforcing apparatus of a metal material for reinforcing a part of the metal material, comprised of:

a front punch and a rear punch nipping and pressing the metal material; and

a rotate means for rotating the front punch and the lower punch about axis thereof, respectively.